

Botrychiums of the Central States

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In examining the herbaria of several noted institutions of the Middle West, I have been forcibly impressed by the different zonal arrangements of the various species of the *Botrychium* group growing in the region drained by the Mississippi River and some of its tributaries.

In corresponding with Prof. F. K. Butters, of the University of Minnesota, he informed me that there were a number of sheets in their herbarium containing specimens labeled *Botrychium obliquum*, but to his mind they were incorrectly labeled, that they were for the most part really *Botrychium ternatum* var. *intermedium*. He stated that one sheet contained specimens that may be *B. ternatum* var. *oneidense*. At that time *Botrychium dissectum* had not been found in the state. I obtained a loan of herbarium material from Prof. Butters, and, after a careful study, I concluded he was correct in stating that *B. obliquum* was not represented in the state flora of Minnesota. Also that *B. ternatum* var. *oneidense* was found there.

About this time I borrowed material from the Public Museum of Milwaukee, Wisconsin, in order that I might study the *Botrychiums* of that state. I was not able to see the material from the University herbarium. The numerous records of *Botrychium obliquum* presented in No. 4, Vol. 18, of the *FERN JOURNAL*, by Steil and Fuller, were perhaps made from the labels without studying the specimens concerned. I found, as in the case of the Minnesota ferns, that nearly all the plants labeled *B. obliquum* were really *B. ternatum* var. *intermedium*. There was one exception. One plant labeled *B. obliquum* from the locality of Milwaukee was *B. obliquum* var.

tenuifolium. I wondered how that could be possible, but noticing on one lower corner the word (over) I turned the label and saw written "Arkansas, Dr. H. E. Hasse." It seems that in some way this specimen had been collected by Hasse in Arkansas and as it had been deposited in the Milwaukee Public Museum someone had incorrectly labeled it from the district of Milwaukee. There were three sheets labeled *B. ternatum* var. *rutaefolium*, but I am eliminating the name *rutaefolium* and classing them all *B. ternatum* var. *intermedium*, as I can see no reason for determining the small specimens *rutaefolium*, and the large ones *intermedium*. In corresponding with Mr. C. A. Weatherby he expressed his opinion that *rutaefolium*, at least so far as most of the specimens so labeled are concerned, was nothing more than a juvenile form of *intermedium*.

In the collection from the Milwaukee Herbarium there were four sheets that contained specimens of *B. ternatum* var. *oneidense*. Three of them were classed as *B. obliquum*, but the label on one sheet stated that the specimen appeared more like *oneidense*. I consider it a good typical specimen. The specimen had been collected near Milwaukee. There were three other sheets of the same species. One had been collected in Rush County, one from Wood County, and one from Shawano County. These four specimens without doubt are *B. ternatum* var. *oneidense*.

In Minnesota, besides the station in Houston County, there was one plant from Rush City which I consider is a specimen of *B. ternatum* var. *oneidense*, and Prof. Butters expressed himself in favor of my decision. There were several sheets from Minnesota that were classed as *Botrychium ternatum* var. *rutaefolium*, but I am placing them all as *B. ternatum* var. *intermedium*.

In examining the Botrychiums from the herbarium of the University of Illinois, I found one specimen of *B. ternatum* var. *oneidense* collected in Michillinda, Michigan. This station is just across the lake from Milwaukee. In this collection was a sheet of *B. ternatum* var. *intermedium* taken at Millers, Indiana. That town is at the extreme south end of Lake Michigan. This is the farthest south for that fern of any record that I have seen. In the Illinois collection there are three sheets of *B. obliquum* and one of *B. dissectum* from stations in Illinois and one of *B. obliquum* from a station in Indiana. All three stations of *B. obliquum* in Illinois are from the south half of the state. The station for *B. dissectum* is from the north part. In corresponding with Mr. E. J. Palmer he informed me that he had found *B. obliquum* and *B. dissectum* growing together in Franklin County, which is in the extreme southeastern part of the state.

In a visit to the herbarium of the Missouri Botanical Garden I saw specimens of *B. obliquum* from Annapolis, Allentown, Carthage, Poplar Bluff, Campbell, Swope Park, Franklin County, and St. Genevieve County, Missouri. I learned from Mr. Palmer, that he had found it at both Reeds and Carthage, Missouri, and that Mr. B. F. Bush had found it in Jackson County, near Kansas City, Missouri. That gives ten stations from Missouri, the largest number from any state in the Mississippi River Valley. *B. dissectum* was represented from Valley Park, Annapolis, Allentown, and one other station from St. Louis County. That gives three stations for St. Louis County and one for Iron County, a larger number than from any other state of the Mississippi River region. Very singular, but this herbarium at the Botanical Garden did not contain a single speci-

men of *B. obliquum* or *B. dissectum* from Illinois, although it had specimens of either or both ferns from Ohio, Kentucky, Tennessee, and other states to the east and south.

In the herbarium of the State Agricultural College at Ames, Iowa, is a specimen of *B. ternatum* var. *intermedium* from Fayette, Iowa. Prof. B. Shimek, of the State University at Iowa City, informs me that he collected *B. obliquum* near Cedar Rapids. I have located three stations for *B. obliquum* in Van Buren County, two of them near Bentonsport, and one near Keosauqua, besides the station for *B. dissectum*. In the three stations for *B. obliquum* I have not found a single plant of *B. dissectum*. Neither does *B. obliquum* grow at the station of *B. dissectum*.

While at the Missouri Botanical Garden I examined specimens which were collected by Mr. E. J. Palmer in Arkansas and Texas. There were also specimens from Arkansas, collected by Dr. Greenman, deposited there. All those collected from Arkansas and east Texas apparently were *B. obliquum* var. *tenuifolium*.

The stations representing *B. ternatum* var. *intermedium* in Minnesota from the university herbarium were: Lake Itasca, Leaf Mountain, Onania, Chisago, Clear Lake, Grand Marais, Ft. Snelling and Sandy Lake. The last place I could not find on the map. The other places are all in the north half of the state. The stations in Wisconsin were from Antigo, Merrill, Rine-lander, Prentice, Marinette (two stations), Mountain, Rib Lake, and Ellison Bay. I obtained specimens from Mrs. Summerville at Superior, and from another party at Barksdale. As I did not see the specimens from Marquette University I do not know where to place them. Some of them no doubt were *B. ternatum* var.

oneidense and some *B. ternatum* var. *intermedium* so I am not considering them in this arrangement. Now look at the map of these two states and you will see that *B. ternatum* var. *intermedium* is from the north half of both states. There may be a few scattering stations farther south in Wisconsin, one station at Fayette, Iowa, and one at Millers, Indiana, showing that the southern limit for the zone for *B. ternatum* var. *intermedium* is north Iowa, and north Indiana, but it becomes more plentiful as you advance northward.

Botrychium ternatum var. *oneidense* is represented from Spring Grove and Rush City, Minnesota, and from Ladysmith, Marshfield, Keshna, and Milwaukee in Wisconsin, and across the lake in Michigan at Michillinda. These stations are in the south part of the *B. ternatum* var. *intermedium* zone.

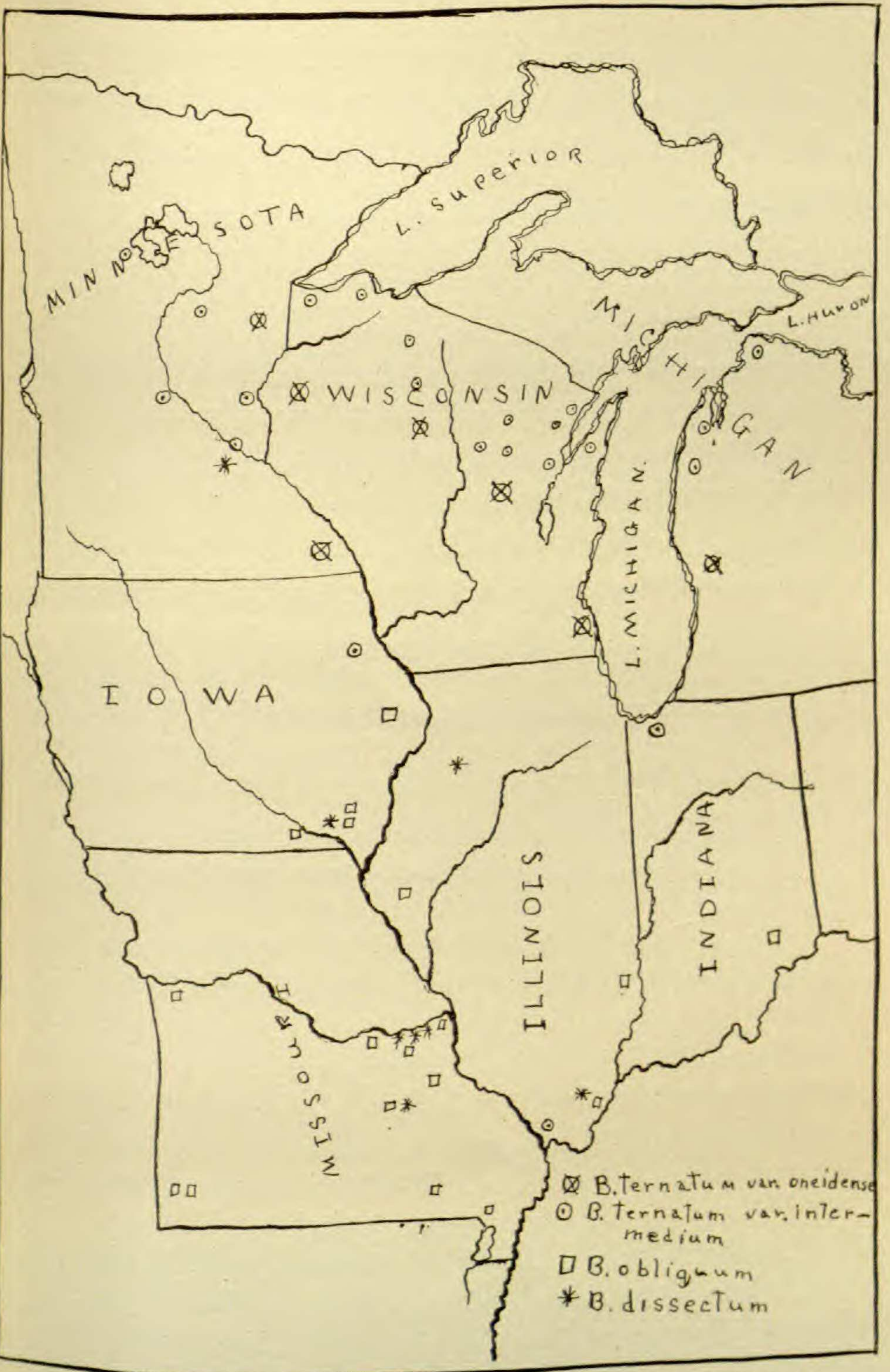
Botrychium obliquum occurs from the south limit of *B. ternatum* var. *intermedium* zone, and ranges southward. It is represented at the Illinois University herbarium from Carlinsville, Olmstead and Mt. Carmel; and Mr. E. J. Palmer found it in Franklin County. In Missouri it is quite plentiful in the south half of the state, but has not been found in the north part to my knowledge. In Iowa there are three stations in Van Buren County, and one near Cedar Rapids. The Cedar Rapids station marks the extreme north limit of *B. obliquum* in the Mississippi Valley region, but as we travel eastward the zone seems to extend farther north.

Botrychium dissectum occupies almost the same zone as *B. obliquum*, but extends farther north and overlaps the southern part of the *B. ternatum* var. *intermedium* zone. With only one exception does it extend south into the zone of *B. obliquum* var. *tenuifolium*, which occupies the southern part of the eastern United States. That exception is two plants collected at Chipley,

Florida, by Miss Sadie Price. Chipley is in the northwest part of the state. Eaton collected four specimens at Cades Cove, Tennessee, which he placed in the herbarium of the Missouri Botanical Garden. Cades Cove is not in the *B. obliquum* var. *tenuifolium* zone. I have no record of it extending that far north. I have collected it on Sand Mountain near Long Island, Alabama. I have also collected *B. obliquum* within one mile of the station of *B. obliquum* var. *tenuifolium*, but the latter grows at a lower altitude along a creek bottom land, while *B. obliquum* was found higher up on the plateau.

There is one more feature I wish to speak of in this article. It is the time of fruiting of the different members of this group. Of the specimens both *B. t.* var. *intermedium* and *B. t.* var. *oneidense* from Minnesota, the larger number having ripe spores had been collected in August or earlier; only one plant had been collected in September; but it might have been collected earlier as its spores were perfectly ripe. Some of them had been collected in June, but the spores, though formed, were not ripe. Of the specimens from Wisconsin both *B. t.* var. *intermedium* and *B. t.* var. *oneidense* with mature spores were collected either in August or the first of September, but perhaps those taken in September could have been collected in August with ripe spores. Of four sheets of *B. t.* var. *intermedium* in the Illinois collection which had been taken in Michigan all but one had been collected with ripe spores in August. One from Michigan reported no date. The specimen from Indiana was also collected in August with ripe spores. The one specimen of *B. t.* var. *oneidense* from Michigan was collected in August with ripe spores.

Of the plants of *B. obliquum* from the Illinois collection one plant only had a fertile frond, and it was collected at Mt. Carmel, Illinois, September 30. Of all the



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plants of *B. obliquum* that I have found here in Iowa not one had produced ripe spores before October; and some were as late as November.

Botrychium dissectum also ripens its spores not earlier than the last of September and often as late as November. This seems to show that *B. obliquum* and *B. dissectum* mature at least a month later than *B. t.* var. *intermedium* and *B. t.* var. *oneidense*.

These notes will give some idea as to the difference in life history of this group of Botrychiums growing in the country drained by a large part of the Mississippi River.

BENTONSPORT, IOWA

Tropical American Isoetes

T. CHALKLEY PALMER

In a former number of this JOURNAL (Vol. 19, No. 1), I commented on the scarcity of material representative of *Isoetes* from South America. This condition bids fair to mend with lapse of time. At present, I am able to record additional collections from Tropical America as follows:

ISOETES MARTII A. Br. A single specimen was collected by Dr. Francis Pennell (*Pennell and Hazen*, No. 9958) in August, 1922, in Colombia, Department of Caldas. This is in the Herbarium of the Academy of Natural Sciences of Philadelphia. It is typical in every respect except as to length of leaves. These are quite short compared with the 24-52 cm. seen in previous specimens—a difference of ecological significance only.

ISOETES CUBANA Engelm. Collected by W. C. Meyers, No. 122, in British Honduras, August, 1930 (U. S. National Herbarium No. 1491113). This is of very special interest in that it is only the second gathering of the